INTRODUCTION

We use post-earthquake lidar data [1] to remotely map surface ruptures and measure offsets produced by the 2019 Ridgecrest Earthquake sequence. The 4 July Mw 6.4 and 5 July Mw 7.1 earthquakes produced surface rupture zones approximately 20 km and 50 km in length, respectively. Densely ruptured zones span up to four kilometers in width for both events, with numerous surficial fractures occurring more than 10 km from the main rupture.

GOALS

1) Develop an objective, uniform map product
2) Test the reproducibility of remote surface-rupture mapping between individual remote mappers
3) Test the relative accuracy of remote versus field-derived surface-rupture mapping
4) Evaluate utility of lidar versus other data sets in post-earthquake response

APPORACH

1) Use lidar [1] visualizations to map rupture. Each author produced a map independently without reference published maps and without comparison to each other’s efforts (Fig. 4).
2) Convert map shapefiles (both our maps and published maps [2][3]) to 1m rasters (Fig. 2). Rasterization removes line length and continuity from analysis to focus on relative similarity of mapping efforts.
3) Add 1m buffer to either side of rasterized lines (Fig. 2). Buffer allows for differences in line placement when mapping (e.g. top vs. bottom of a scarp).
4) Compare maps using amount of pixel overlap (Fig. 3)

MAP COMPARISON AND ANALYSIS

In general, when mapping the same feature, the mappers’ lines are within a few meters of each other. The differences in the maps come mostly from mapping different features as part of (or not part of) the rupture.

Low percent overlap between the authors of this study and the DuRoss et al. 2020 and Ponti et al., 2020 maps is due to our inability to see small features, especially those with little vertical displacement, in the lidar.

Table 1. (above) Percent overlap of mapped rupture trace between mappers. In this table, the 1m raster for each map listed in the header is compared to the buffered raster for each map in the “Compared to” column. We also compared rasters with 2m and 5m buffers. The Ponti et al. 2020 [2], map includes a mix of remote and field data, so “Compared to” column have a 1m buffer to allow for small differences in line placement (see Approach section). We also compared rasters with 2m and 5m buffers. The Ponti et al. 2020 [2], map includes a mix of remote and field data, so “Compared to” column have a 1m buffer to allow for small differences in line placement (see Approach section). We also compared rasters with 2m and 5m buffers. The Ponti et al. 2020 [2], map includes a mix of remote and field data, so “Compared to” column have a 1m buffer to allow for small differences in line placement (see Approach section).

DUOMIN SLIDAR: DETAILED MAP COMPARISON

We compared the line and shapefile maps of the 2019 Ridgecrest Earthquake Ruptures with Airborne Lidar and Imagery

CONCLUSIONS

1) Our maps agree ~35-55 %, <15% of the published maps overlap with our mapping (Table 1).
2) Map disagreement depends on the number and location of mapped lines (Fig. 5), especially when comparing our maps to Ponti et al., 2020 [2].
3) Post-event lidar alone cannot fully capture surface ruptures with low vertical offset

References